DRAFT
ENGINEERING DESIGN REPORT
MTCA CLEANUP ACTION
Equilon Enterprises LLC
Seattle Terminal

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1 INTRODUCTION

1.1 Introduction

Equilon Enterprises LLC (Equilon) has entered into a Consent Decree (Consent Decree No. 99-2-07176-0 SEA) with the Washington State Department of Ecology (Ecology) to provide for remedial action at its Seattle Terminal. Equilon's Seattle Terminal Site (the Site) is comprised of three parcels located at 2555 13th Avenue SW, 1835 13th Avenue SW, and 1711 13th Avenue SW on Harbor Island in Seattle, Washington. Lovely Consulting, Inc. (LCI) and IT Corporation have prepared this Engineering Design report on behalf of Equilon to meet the requirements of the Consent Decree, the Model Toxics Control Act (MTCA) and specifically Section 173-340-400 (4)(a) of the Washington Administrative Code (WAC).

1.2 Cleanup Action Goals

Specific cleanup goals for the Site include the following cleanup and performance requirements:

- Remove recoverable free product from the groundwater throughout the Site
- Excavate accessible soil hot spots over 10,000 milligram/kilogram (mg/kg) Total Petroleum Hydrocarbons (TPH) in the subsurface (adjacent to the shoreline) to improve groundwater quality at the shoreline
- Excavate accessible soil hot spots over 20,000 mg/kg TPH in the subsurface soil (in the inland portions of the Site) to enhance biodegradation of residual TPH and provide more timely restoration
- Excavate soils over 10,000 mg/kg lead in the surface soil
- Cap or excavate accessible soils over 1,000 mg/kg lead and 32.6 mg/kg arsenic in the surface soil
- Implement groundwater monitoring program

1.3 General Facility Information

The Equilon Seattle Terminal (20.5 acres in size) consists of the main terminal and main tank farm, located inland in the north-central part of Harbor Island; the north tank farm, located north of the main terminal; and the Shoreline Manifold Area and Dock, located adjacent to Elliott Bay at the north end of Harbor Island (Figure 1). The facility is an active fuel distribution terminal comprised of 83 aboveground product storage tanks, aboveground fuel pipelines, underground fuel pipelines, fuel and lubricants truck loading racks, pipeline receipt facilities, rail receipt facilities, and dock. The Terminal receives product (light oils or fuels and lubricating oils) via the Olympic Pipe Line, barge, truck, and rail. The design and implementation of cleanup actions at this "active" site must incorporate operational constraints (working around fuel shipments), potential safety hazards (fire and explosion), structural integrity of adjacent structures (bulkhead, pipelines, tanks, building foundation), and environmental controls.

Groundwater flows in a radial pattern outward from the center of Harbor Island and enters the marine surface water at the island's edge. The site is zoned industrial and meets the industrial criteria established under WAC 173-340-745. The Site will remain an industrial facility in the foreseeable future because of the site zoning, and, perhaps more importantly, because of the substantial industrial improvements to Harbor Island (e.g., construction of cargo handling facilities and construction of major petroleum distribution pipelines for the island). Ecology and EPA have determined that there is no current or planned future use of groundwater beneath Harbor Island for drinking water purposes.

1.4 Operation and Maintenance of the Cleanup Action

Equilon will own, operate, and maintain the cleanup action during and following remedial action (construction activities).

1.5 Summary of Remedial Investigation/Feasibility Study

1.5.1 Remedial Investigation

The following section summarizes the nature and extent of contamination at the Site based on the results of the remedial investigation (RI), Interim Actions and focused feasibility study (FFS). A general discussion of the contaminants detected at the site is presented first. A summary of the floating product (product) beneath the Shoreline Manifold Area is presented next since this is the primary area of focus for the Site's cleanup action. Sections on TPH; benzene, toluene, ethylbenzene, and xylenes (BTEX) and carcinogenic polyaromatic hydrocarbons (cPAHs); and arsenic, copper, and lead follow.

The results of the site characterization activities conducted during the RI indicate that contaminants present in soil and groundwater at the inland portions of the site are primarily weathered total petroleum hydrocarbons as diesel (TPH-D) with lesser amounts of weathered gasoline (TPH-G) and heavier oil (TPH-O), and a few inorganic metals (arsenic, copper and lead). The weathered TPH is most likely the result of historic spills at the site. Arsenic and lead in the surface soil are the result of airborne releases from the former smelter. Copper, only found in groundwater, is attributed to natural background on Harbor Island. The inorganic metals are present at low concentrations at a few locations in groundwater. In the north tank farm, there is a small amount of measurable floating product at one location, in the vicinity of MW-204. Since completion of the RI, approximately 700 gallons of unleaded gasoline was released in 1996 from a 'pinhole' leak in a section of a pipe at the Shoreline Manifold Area. At the Shoreline Manifold area, in addition to weathered TPH-D in soil, there is localized contained floating product on the water table. At the main terminal and main tank farm, lead is present at higher concentrations in surface soil than subsurface soil due to airborne transport of lead particulate in stack emissions from historic lead smelter activities adjacent to the Equilon Terminal.

1.5.1.1 Floating Product

Data collected during the FFS show that the impacted area of primary concern at the site is a small product plume located beneath the Shoreline Manifold Area adjacent to Elliott Bay. A small lens of floating product is trapped behind the foundation of the island bulkhead that forms a partial barrier to groundwater flow to the Bay. The water table elevations fluctuate seasonally due to rainfall and in response to tidal influence from the Bay; however, the water table elevation does not drop below the base of the bulkhead. Due to the dampening effect of the bulkhead structure, water table fluctuations in response to tidal influence and seasonal fluctuations are 1 to 2 feet near Elliott Bay. The resulting "smear" zone of product in soil beneath the product plume is approximately 2 feet thick.

An interim product recovery system has been in operation under the Shoreline Manifold Area since the release was discovered in 1996. This system has been effective in removing product on top of the groundwater table, preventing migration of product sheen into Elliott Bay, and ensuring protection of receptors in Elliott Bay. Based on the amount of product and vapor recovered (about 500 gallons), and dissolved constituents in water recovered to date, the interim system has recovered nearly all of the released product.

1.5.1.2 TPH, BTEX, and cPAHs

RI data also indicate that elevated concentrations of TPH are present in subsurface soil within localized inland areas of the main terminal, main tank farm, north tank farm; and Shoreline Manifold Area. Concentrations of TPH-G and TPH-D have been detected in

groundwater above cleanup levels within or in close proximity to areas where the historical spills or one recent (1996) spill occurred. Groundwater monitoring results indicated concentrations of TPH-G exceeded the cleanup level in 25 percent of the samples, exceeded the cleanup level of TPH-D in 2 percent of the samples, and did not exceed the cleanup level for TPH-O in any samples. Benzene and carcinogenic polynuclear aromatic hydrocarbons (cPAHs) have also been detected in groundwater above cleanup levels. Concentrations of benzene exceeded the cleanup level in approximately 35 percent of the groundwater samples. Concentrations of cPAHs exceeded the cleanup level in 1 percent of the samples collected and only in one well (MW-208). In addition to collecting groundwater quality data, groundwater contaminant modeling was conducted during the RI and FFS. The ground water quality and modeling results indicate that dissolved-phase hydrocarbons are not migrating off site at concentrations that pose a threat to surface water at the shorelines of Harbor Island.

1.5.1.3 Arsenic, Copper, and Lead

Arsenic was found in surface soil within portions of the main tank farm above Harbor Island action levels set in the U.S. Environmental Protection Agency (EPA) Record of Decision (ROD) for the surface soils but below MTCA cleanup levels. Lead was identified in surface soil in portions of the main tank farm and adjacent to the oil/water separator above the levels designated in the EPA ROD for the surface soils. The occurrence of lead and arsenic are most likely associated with stack emissions from the former lead smelter. Dissolved copper and lead are the only metals detected in groundwater above cleanup levels during the RI monitoring. Concentrations of dissolved copper and lead exceeded the cleanup level in approximately 44 percent and 1 percent of the samples collected, respectively. Dissolved copper and lead were also detected across much of the northern portion of Harbor Island during the USEPA RI, indicating elevated background concentrations. Copper and lead were not detected in subsurface soils above the cleanup level. These inorganic metals are associated with the former lead smelter and marine paints used at shipbuilding and repair facilities adjacent to the Equilon Terminal (Tetra Tech 1988).

1.5.1.4 Marine Sediments

Based on the results of marine sediment sampling conducted by EPA adjacent to the site, sediments have not been impacted by adjacent shoreline activities (e.g., Equilon operations) above levels that would cause adverse effects to aquatic life. No further action is proposed by EPA for the marine sediments adjacent to Equilon's property.

1.5.2 Feasibility Study and Cleanup Action Plan

Ecology issued a Cleanup Action Plan (CAP) under MTCA for the Site. The CAP, dated September 28, 1998, selects Alternative 3A. Alternative 3A in the CAP is modified from Alternative 3A in the *Final Focused Feasibility Study Report* (LCI and EMCON 1997).

Ecology developed the modified Alternative 3A to be consistent with the island-wide Federal Superfund cleanup and to address public concerns raised during the public meeting on the ARCO Terminal Cleanup Action Plan. Equilon Enterprises LLC has agreed to implement the modified Alternative 3A selected in the CAP through the Consent Decree. A brief summary of the Alternative 3A in the Focused Feasibility Study and the selected cleanup action follows.

Alternative 3A in the FFS included 1) active and passive product recovery and associated dissolved petroleum hydrocarbons by the shoreline, 3) reuse of recovered product, 4) treatment of groundwater with dissolved petroleum hydrocarbons (before disposal), 5) capping or excavating lead-impacted surface soil near the oil/water separator; maintaining the gravel cap in the main tank farm, 7) groundwater monitoring at conditional point of compliance wells, 9) access restrictions, and 11) deed restrictions.

Alternative 3A in the CAP includes 1) active and passive product recovery and associated dissolved petroleum hydrocarbons by the shoreline, 2) source identification and removal/treatment at property boundaries to contain dissolved petroleum hydrocarbons within property limits (if triggered by contingency plan), 3) reuse of recovered product, 4) treatment of groundwater with dissolved petroleum hydrocarbons (before disposal), 5) capping or excavating surface soil impacted with lead and arsenic near the oil/water separator and the main tank farm, 6) excavating accessible TPH soil hot spots in the subsurface to the extent practicable, 7) groundwater monitoring at compliance and performance wells, 8) natural attenuation for the TPH residuals in the subsurface below action levels, 9) access restrictions, 10) contingency plan, and 11) deed restrictions.

As described above, the modified Alternative 3A (the selected Alternative in the CAP) includes the addition of items #2, #6, #8, and #10; and expanding of items # 5 and #7. Major cleanup components added in the Selected Alternative 3A are excavation or capping of lead- and arsenic- impacted surface soil in the main tank farm, excavation and removal of TPH hot spot soils (as practicable) at the Shoreline Manifold Area and selected areas of the Main Terminal, expanded groundwater monitoring, natural attenuation, and contingency plan.

The modified alternative provides for removal of lead and arsenic consistent with the island-wide cleanup, source removal of areas with the most impacted TPH soils, an extensive monitoring network, and a comprehensive contingency plan.

2 PROPOSED CLEANUP ACTIONS

2.1 Overview of Cleanup Actions

Cleanup actions at Equilon's Seattle Terminal include petroleum product recovery and product recycling; excavation of TPH Hot Spots in subsurface soil; off-site thermal desorption or off-site landfill disposal for TPH Hot Spot soil; excavation of lead- and arsenic-impacted surface soil; and stabilization and off-site disposal of lead- and arsenic-impacted soil. The volumes of Hot Spot soils (prior to excavation) above and below groundwater are presented in Table 1. The characteristics, location, and quantity of materials that will be removed or treated (to the extent practicable) during this cleanup are described in Section 2.2 by location or cleanup area (Drawing 1). The quantity of materials that will be removed may differ from the quantity in Table 1 because of construction and safety constraints.

2.2 Location and Characteristics of Product Recovery

2.2.1 Shoreline Manifold Area

An active product recovery system was installed as an interim action at the Shoreline Manifold Area (Figure 2). Based on the product recovered to date, most of the released product that can be recovered has been recovered. Equilon will continue to operate the product recovery system until hot spot soil excavation occurs. During hot spot soil excavation at the Shoreline Manifold Area, floating product and water will be pumped from the excavation. The floating product will be separated from the water and recycled.

2.2.2 North Tank Farm

Passive product recovery has been performed in MW-204 since 1995. At the time of TPH Hot Spot soil excavation at the Shoreline Manifold Area, Equilon will initiate more aggressive product recovery using periodic vacuum-enhanced product extraction (bioslurping) at MW-204.

2.3 Location and Characteristics of Soil Removal

2.3.1 Area 1. TPH Hot Spot Excavation at Shoreline Manifold Area

Subsurface soil containing TPH Hot Spot concentrations (10,000 mg/kg or greater) will be excavated to the extent practicable at Equilon's Shoreline Manifold Area (Drawing 2). Soil will be excavated the extent practicable without adversely impacting the structural integrity of the adjacent bulkhead, aboveground manifold, and below ground pipelines. The TPH in soil at this location has been identified primarily as TPH-D and is consistent with the material (diesel fuel) from an historical upland release. The hot spot soil removal will be performed in two phases: Phase 1 includes the impacted soil [248 cubic yards (CY)] that can be removed without impacting adjacent structures and Phase 2 includes additional impacted soil (450 CY) that will be excavated when pipelines are relocated aboveground (see Section 3.3.2).

2.3.2 Area 2. TPH Hot Spot Excavation in Main Tank Farm

Subsurface soil containing TPH Hot Spot concentrations (20,000 mg/kg or greater) will be excavated adjacent to above ground storage tank No. 31538 (Drawing 2). Soil will be excavated the extent practicable without adversely impacting the structural integrity of the adjacent tank, above ground pipelines, and firewall. The TPH at this location has been identified as TPH-D and is consistent with the material (diesel fuel) stored in fuel storage tanks located to the south. The impacted soil, without impacting adjacent structures, is 227 CY (see Section 3.33).

2.3.3 Area 3. Surface Soil Excavation in Main Tank Farm

Surface soil exceeding lead concentrations of 1,000 mg/kg and arsenic concentrations of 32.6 mg/kg will be excavated to the extent practicable within the Main Tank Farm (Drawing 3). The impacted area averages 6 inches in thickness and covers an area approximately 215,000 square feet. The excavated soil volume is approximately 4,000 CY.

2.3.4 Area 4. Surface Soil Excavation at Oil/Water Separator

Surface soil exceeding lead concentrations of 1,000 mg/kg will be excavated adjacent to the Oil/Water Separator (Figure 3). The impacted area averages 4 inches in thickness and covers an area approximately 2,670 square feet. The excavated soil volume is approximately 49 CY.

2.3.5 Area 5. TPH Hot Spot at Former Warehouse UST

Subsurface soil containing TPH Hot Spot concentrations (20,000 mg/kg or greater) will be excavated at a former underground storage tank (UST) location (Figure 4). Soil will be excavated to the extent practicable without adversely impacting the structural integrity of the adjacent warehouse foundation. The TPH at this location has been identified as TPH-O and is consistent with the material (lubricating oil) stored in the former UST. The impacted soil, without impacting adjacent structures, is approximately 58 CY.

2.4 Conceptual Plan for Cleanup Action

Cleanup actions at the Equilon Terminal Site (as described under Section 1.5.2) includes a combination of technologies: product recovery and product recycling, immobilization of lead- and arsenic-impacted soil prior to disposal, destruction or off-site disposal of petroleum impacted soils, containment via asphalt cap, institutional controls and monitoring. Potential off-site landfill disposal or thermal desorption treatment facilities include TPS Technologies, Inc. in Tacoma, Washington; Waste Management's Arlington Landfill in Arlington, Oregon; Waste Management's Columbia Ridge Landfill in Oregon, and the Rabanco Landfill in Roosevelt, Washington. The specific facilities will be selected during the construction bidding process. The selected facility will be determined by the nature of the waste (Washington State Dangerous Waste or Problem Waste), the acceptance criteria of the receiving facility, or treatment limitations (e.g., the soil moisture content is too high). The facilities cited above have received and successfully treated or disposed of TPH- and lead-impacted soil from the Site during interim actions and at similar sites within the region.

Equilon will be implementing cleanup that incorporates technologies [(i) reuse or recycling, (ii) destruction or detoxification, (iv) immobilization of hazardous substances] with a higher preference under MTCA [WAC 173-340-360(4)] as follows:

- (i) reuse or recycling – Recycling of recovered petroleum product from Shoreline Manifold Area
- (ii) destruction or detoxification – Destruction of petroleum-impacted soils via thermal desorption
- (iv) immobilization of hazardous substances – Stabilization of lead- and arsenic-impacted soil prior to disposal

By using technologies with a higher preference under WAC 173-340-360 (4), this cleanup action meets the MTCA objective for a permanent solution to the extent practicable.

Product recovery and product recycling will continue at the Shoreline Manifold Area and the North Tank Farm. Soil removal will occur at five areas on the Site as described in Section 2.3 above. The conceptual plan for site cleanup is shown on a flow chart (Figure 5), depicting the general steps for the remedial action for each of the cleanup areas: soil excavation, disposal at off-site landfill or thermal desorption treatment facility, backfill and regrading, and site cap replacement.

2.4.1 Soil Excavation

The planned areas for excavation and removal of TPH Hot Spot soils and Lead-impacted surface soil are shown on Drawings 2 through 6 and Figures 3 and 4. An overview of the sequencing and events associated with remedial excavation activities is presented below:

- Construct temporary erosion and sediment control measures
- Prepare temporary soil stockpile areas
- Prepare equipment staging area, decontamination station, residuals' storage area, and site ingress and egress
- Delineate health and safety-regulated areas (exclusion zone, contaminated reduction zone and support zone)
- Install shoring as needed to meet state construction safety regulations
- Remove and segregate surface cap material (asphalt or gravel)
- Excavate contaminated soil using an excavator (and backfill before proceeding with next excavation)
- Field screen soil during excavation and segregate potentially noncontaminated overburden from soil to be removed from the site
- Sample stockpiled contaminated soil to determine appropriate off-site disposal or treatment
- Temporarily stockpile noncontaminated soil that may be reused as backfill and stockpile soil that will be hauled off site
- Implement free product removal in TPH Hot Spot excavations using a vactor truck as needed to allow for removal of soil
- Obtain soil samples from sidewalls and bottom of TPH hot spot excavations. Document sample location and depth. Analyze soil samples for TPH-G,

TPH-D, and TPH-O. Soil samples will be obtained at the rate of approximately one sample per 20 feet along the sidewall with two soil samples collected from the bottom of the excavation.

- Obtain confirmatory soil samples at the bottom of the excavation upon completion of the lead surface soil cleanup. Samples will be analyzed for lead and arsenic in the Main Tank Farm and for lead adjacent to the oil/water separator. Samples will be collected at the frequency of approximately one sample per every 5,000 square feet in the Main Tank Farm and one sample per 600 square feet adjacent to the oil/water separator.

- Obtain confirmation soil samples from noncontaminated overburden stockpiles. The sampling frequency will be in accordance with the following Ecology guidance:

BULK CUBIC YARDS OF SOIL	MIN. NUMBER OF SAMPLES
0-100	3
101-500	5
501-1,000	7
1,001-2,000	10
>2,000	10 + 1 for each additional 500 CY

All work will be conducted in accordance with applicable federal, state, and local regulations including OSHA (Occupational Safety and Health Administration) and L&I (Washington State Department of Labor and Industries), for excavation safety and for operations at hazardous waste sites. Ecology guidance will be followed for all sampling activities.

2.4.2 Off-Site Disposal or Treatment

Waste characterization or waste profiling sampling (as described above) will be performed to determine the appropriate disposal or treatment of the contaminated soil. The steps for sequencing of off-site disposal or treatment are described below:

- Verify approved waste profile by designated disposal or treatment facility. The selected facility will be determined by the nature of the waste (Washington State Dangerous Waste or Problem Waste) and acceptance criteria of the receiving facility. Potential off-site landfill disposal or thermal desorption treatment facilities include TPS Technologies, Inc. in Tacoma, Washington; Waste Management's Arlington Landfill in Arlington, Oregon; Waste Management's Columbia Ridge Landfill in Oregon, and the Rabanco Landfill in Roosevelt, Washington.

- Load excavated contaminated soil into trucks
- Cover contaminated soil
- Transport soil directly to the facility or to a local landfill transfer station
- Document the number of trucks , the approximate volume of soil transported from the Site, and the weight of the material received at the landfill or treatment facility

2.4.3 Backfill, Regrading, and Recapping

Backfilling, regrading, and cap replacement will be performed upon completion of excavation activities. The sequence of steps for this phase of the remedial action is described below:

- Excavations will be backfilled with clean overburden or imported noncontaminated soil
- Backfilling will be performed on an excavation by excavation basis (i.e., the excavation will be backfilled prior to commencing with the next excavation)
- The excavation will be backfilled and filled up to the finished surface grade
- The areas will be regraded as needed to the finished grade
- The area with be recapped with the existing cap material (asphalt or gravel) in a condition that it is contiguous with the surrounding cap material

2.5 Cleanup Costs

Cleanup at the Equilon Seattle Terminal has included implementation of the remedial investigation/feasibility study and interim remedial actions. Ongoing and future costs include remedial design and remedial action costs. Cleanup costs incurred for interim actions and estimated future costs to complete the remedial design and cleanup are approximately $ 3.5 million.

3 DESIGN PARAMETERS

3.1 Introduction

As presented in Section 2, soil removal actions will be performed at five areas within the Site (Drawing 1). The site-specific characteristics affecting design/construction and operations, engineering justification, and expected treatment/containment efficiencies for these five actions and for product recovery activities are presented below.

3.2 Site-Specific Characteristics Affecting Design/Construction and Operation

The Equilon Seattle Terminal is an active petroleum fuel distribution facility, receiving and distributing petroleum product on a daily basis. In addition, the majority of the cleanup actions include subsurface excavations adjacent to structures. The nature of an active facility coupled with working around structures, especially structures used to store petroleum product (e.g., tanks, pipelines), affect the remedial design and remedial construction at this Site. Structurally sensitive structures in the cleanup area footprints include 1) above ground storage tanks, 2) tank farm containment wall, 3) above ground and below ground pipelines, 3) seawall bulkhead, and 4) building foundation. It is critical to recognize the operational constraints and integrate those constraints into the design in order to ensure that the cleanup does not create a safety hazard, increase the environmental risk by causing a release to the environment, or shut down the facility. This cleanup is not a cleanup at a closed facility or in an open field with no structures or underground utilities. The design criteria, (presented in Section 3.3) and project schedule (presented in Section 10) take these constraints into consideration by:

- Design development with sound engineering basis (e.g., sloped excavations to minimize excavation sloughing and impact to structural integrity of adjacent structures)

- Performance of the work during the dry months (with the lowest groundwater levels) to provide the best conditions for excavating the TPH Hot Spots to the extent practicable

- Performance of the work during the dry months to minimize the conditions (e.g., rainfall) that will require increased controls to prevent runoff from contaminated soil stockpiles

- Performance of the work at the Site in phases to minimize disruption to the operating facility while prioritizing the cleanup to areas with a greater environmental risk (i.e., performing cleanup at the Shoreline Manifold Area first since the area is located next the Elliott Bay)

- Performance of the Shoreline Manifold Area in two phases: Phase 1 includes excavating all the hot spot soil that is practicable without undermining the structural integrity of the below ground pipelines and seawall bulkhead. Phase 2 includes excavating soil beneath the old pipelines concurrent with relocating the pipelines along the bulkhead without undermining the structural integrity of the seawall bulkhead.

- Performance of the Shoreline Manifold Area and Main Tank Farm cleanups to minimize disruption to terminal operations and keep the construction focused on one cleanup during each construction season. In addition, work is scheduled in separate phases in order to optimize completion of work during the dry season.

3.3 Engineering Justification

3.3.1 Design Criteria, Assumptions and Calculations - Product Recovery

Interim product recovery activities at the Shoreline Manifold Area and the North Tank Farm will continue as outlined in the *Compliance Monitoring Plan* (EMCON and LCI, 1999). Shoreline Manifold Area interim product recovery activities include operation of a product vapor extraction/treatment system and product monitoring. The vapor extraction system is connected to two monitoring wells (MW-211 and MW-212) and eight well points (WP-1 through WP-8). Extracted vapors are discharged under Puget Sound Air Pollution Control Agency (PSAPCA; now Puget Sound Clean Air Agency) Order of Approval No. 6697. Prior to June 1999, vapors were treated with a catalytic oxidizer prior to discharge. Based on decreasing hydrocarbon concentrations in the extracted air, PSAPCA approved removal of the catalytic oxidizer on June 8, 1999. The catalytic oxidizer was disconnected shortly thereafter, but the unit remains on site if needed.

During TPH Hot Spot soil excavation at the Shoreline Manifold Area, product will be pumped from the base of the TPH Hot Spot excavation and periodic vacuum-enhanced product extraction will be initiated at MW-204 in the North Tank Farm. Based on past experience at similar sites, product pumping from open excavations is an effective way to

remove recoverable residual petroleum product floating on the water table. The excavation in the Shoreline Manifold Area will be left open for product pumping until less than 0.01 feet of product are floating on the water surface in the excavation. If less than 0.01 feet of product are floating on the water surface in the excavation prior to pumping, residual product and water will be pumped from the excavation for a period of at least 24 hours prior to backfilling the excavation. Based on previous pumping from Shoreline Manifold Area wells and from an underground storage tank excavation in the Main Terminal, it is anticipated that less than 10 gallons per minute of fluid will be generated from each excavation. Recovered fluid will be hauled off site for recycling and reuse. Periodic vacuum-enhanced product extraction will be performed in MW-204 by lowering a sealable drop tube approximately 2 feet below the groundwater table and activating a vacuum pump. Product and water will be extracted from the well for approximately 30 minutes. Recovered fluid will be hauled off site for recycling and reuse. The periodic events will be performed at a frequency sufficient to recover measurable product and will be performed until two consecutive events do not yield measurable product.

3.3.2 Design Criteria, Assumptions, and Calculations - Area 1. TPH Hot Spot Excavation at the Shoreline Manifold Area

Excavation of subsurface soil containing TPH Hot Spot concentrations at the Shoreline Manifold Area will require protection of the existing pipelines, bulkhead wall, bulkhead-wall-tie-back anchors, fencing, utility poles, and the street to the south (Drawing 2). Review of the soil data indicates that the area is underlain by loose dredged sand and silt with some moisture and a groundwater table approximately 7 to 8 feet below the existing ground surface (bgs). Excavation within the Shoreline Manifold Area will require sloping of the excavation sidewalls to prevent raveling of the excavation from below the existing pipelines or away from the bulkhead wall. Since soil TPH concentrations in the top 4 feet of soil within the Shoreline Manifold Area are below the TPH Hot Spot level, the top 4 feet of soil will be stripped off, stockpiled, and reused in backfilling the excavation. Excavation of contaminated (TPH Hot Spot) soil below a depth of 4 feet will continue to the extent technically practicable considering structural and engineering limitations (estimated to be a depth of 8 feet).

For the sloped excavation sidewall immediately adjacent to the pipelines and the bulkhead wall, a maximum 2 horizontal to 1 vertical (2H:1V) excavation slope will be utilized to provide a factor of safety of 1.2 against slope failure. This factor of safety is generally acceptable for temporary excavations. For other portions of the excavation not adjacent to the pipeline and bulkhead wall, the excavation slopes will be steepened to 1H:2V. These steepened slopes will take advantage of the apparent shear strength of the material in a moist state due to the matrix suction of the water in the pore spaces. This is a temporary condition, and as the excavation slope dries out, the excavation face will start to ravel.

It is not known where the anchor end of the bulkhead-wall-tie-back anchors will be encountered in the excavation, so care must be taken excavate around these anchors, while not exposing too many anchors at one time. For this reason, excavation will proceed in phases, whereby no more than 10 linear feet parallel to the bulkhead wall at the base of the excavation is exposed at once. Exposed anchors and the excavation area will be backfilled over using fill soil placed in 12-inch maximum thickness, horizontal lifts and compacted to a minimum of 90 percent of the modified Proctor density (ASTM D1557) and a moisture content necessary to achieve compaction. This filling will proceed up to the finished surface grade.

Based on the sloping requirements outlined above and assuming a maximum excavation depth of 8 feet, the in-place volume of TPH Hot Spot soil to be removed at the Shoreline Manifold Area with the product pipelines in place (Phase 1) is estimated to be 248 CY, calculated as follows:

$$[(1{,}284 \text{ sf} + 945 \text{ sf} + 669 \text{ sf} + 428 \text{ sf}) \times (2 \text{ feet})] \times (1 \text{ CY}/27 \text{ cubic feet}) = 248 \text{ CY}.$$

Based on the distribution of contaminated soil shown on Drawing 5, it is estimated that an additional 450 CY ((2,883.57 sf + 2,022.64 sf + 1,182.51 sf) x 2 feet x 1 (CY/27 cubic feet) of TPH Hot Spot soil will be excavated after the east-west trending pipelines are removed (Phase 2). The in-place volume of non-impacted soil that will be excavated, stockpiled, and backfilled into the excavation in Phase 1 is estimated to be:

$$[(2{,}105 \text{ sf} + 1{,}674 \text{ sf} + 1{,}307 \text{ sf} + 962 \text{ sf}) \times (2 \text{ feet})] \times (1 \text{ CY}/27 \text{ cubic feet}) = 450 \text{ CY}.$$

The in-place volume of non-impacted soil that will be excavated, stockpiled, and backfilled into the excavation in Phase 2 is estimated to be:

$$(3{,}764 \text{ sf}) \times (2 \text{ feet}) \times (1 \text{ CY}/27 \text{ cubic feet}) = 280 \text{ CY}$$

The sidewall slopes of the Phase 1 and Phase 2 excavations are shown on Drawings 4 and 5 respectively. Detailed volume calculations are provided in Appendix A.

3.3.3 Design Criteria, Assumptions and Calculations - Area 2. TPH Hot Spot Excavation in the Main Tank Farm

Excavation of subsurface soil containing TPH Hot Spot concentrations on the north side of Tank 31538 in the Main Tank Farm will require protection of the existing aboveground tank from potential settlement (Drawing 2). As in the Shoreline Manifold Area, the area is underlain by loose dredged sand and silt with some moisture and a groundwater table approximately 6 to 8 feet bgs. Excavation at this location will require sloping of the excavation sidewalls to prevent raveling of soil below the existing aboveground storage tank. The top 6 inches of soil within the Main Tank Farm area will be stripped off and

disposed of as detailed in Section 3.3.4. Since soil TPH concentrations in the top 4 feet of soil on the north side of Tank 31538 are below the TPH Hot Spot level, soil between 6 inches and 4 feet bgs will be stripped off, stockpiled, and reused in backfilling the excavation. Excavation of contaminated (TPH Hot Spot) soil below a depth of 4 feet will continue to the extent technically practicable considering structural and engineering limitations (estimated to be a depth of 8 feet).

For the sloped excavation sidewall immediately adjacent to the aboveground tank, a maximum 2H:1V excavation slope will be utilized to provide a factor of safety of 1.2 against slope failure. For other portions of the excavation not adjacent to the tank, the excavation slopes will be steepened to 1H:2V. As discussed in Section 3.3.2, these steepened slopes will take advantage of the apparent shear strength of the material in a moist state. This is a temporary condition, and as the excavation slope dries out, the excavation face will start to ravel.

Based on the sloping requirements outlined above and assuming a maximum excavation depth of 8 feet , the in-place volume of TPH Hot Spot soil to be removed in the Main Tank Farm is estimated to be 227 CY, calculated as follows:

$$(1{,}756 \text{ sf} + 1{,}310 \text{ sf}) \times (2 \text{ feet}) \times (1 \text{ CY}/27 \text{ cubic feet}) = 227 \text{ CY}$$

It is estimated that approximately 360 CY of overlying non-impacted soil will be excavated, stockpiled, and backfilled into the excavation, calculated as follows:

$$[(2{,}659 \text{ sf} + 2{,}205 \text{ sf}) \times (2 \text{ feet}) - (2{,}830 \text{ sf}) \times (0.5 \text{ feet})] \times (1 \text{ CY}/27 \text{ cubic feet}) = 308 \text{ CY}$$

The sidewall slopes of the excavation are shown on Drawing 6. Detailed volume calculations are provided in Appendix A.

3.3.4 Design Criteria, Assumptions and Calculations - Area 3. Surface Soil Excavation in the Main Tank Farm

The area to be excavated within the Main Tank Farm is flat but obstructed by numerous pipelines (Drawing 3). Excavation activities will be limited by pipeline locations, tank locations, and site operational considerations (product delivery schedule and daily terminal operating hours). Based on soil data collected throughout the Main Tank Farm, the upper 6 inches of accessible soil within the tank farm will be excavated and removed from the site. Due to the inaccessibility of soil beneath the pipe runs in the main tank farm, soil will not be excavated beneath the pipe runs. Soil will also not be excavated beneath the six soil ramps that allow vehicle access in the tank farm. Since the excavated area is shallow, it is assumed that soil will be excavated up to the edges of pipe runs, ramps, tanks, and concrete. The area of the tank farm not covered by pipe runs, ramps,

tanks, and concrete is estimated to be 215,000 square feet. Based on this area, the approximate in-place volume of soil to be excavated is as follows:

(215,000 square feet) x (0.5 feet) x (1 CY/27 cubic feet) = 4,000 CY

3.3.5 Design Criteria, Assumptions and Calculations - Area 4. Surface Soil Excavation at the Oil/Water Separator

The area to be excavated adjacent to the oil/water separator (Figure 3) is relatively flat, open, and accessible. Based on soil data collected around the oil/water separator, the upper 6 inches of soil surrounding the separator (south of Tank 400, east and south to the fence, and west to the pavement) will be excavated and removed from the site. Since the excavated area is shallow, it is assumed that soil will be excavated up to the edges of fences, pavement, and concrete. Based on a soil surface area of 2,670square feet, the approximate in-place volume of soil to be excavated is as follows:

(2,670 square feet) x (0.5 feet) x (1 CY/27 cubic feet) = 49 CY

3.3.6 Design Criteria, Assumptions and Calculations - Area 5. TPH Hot Spot Excavation at the former Warehouse UST

The area of the excavation at the former warehouse UST (Figure 4) is surrounded by paving. Review of the soil data indicates that the area is underlain by loose dredged sand and silt with some moisture and a groundwater table approximately 5 to 7 feet bgs. The slopes for this temporary excavation will take advantage of the existing moisture in the soil and the paving at the surface to allow excavation slopes as steep as 1H:2V.

Based on this sloping requirement and assuming a maximum excavation depth of 7 feet , the in-place volume of TPH Hot Spot soil to be removed at the location of the former warehouse UST is estimated to be 58 CY, calculated as follows:

(522 sf) x (3 feet) x (1 CY/27 cubic feet) =58 CY

It is estimated that approximately 104 CY of overlying non-impacted soil will be excavated, stockpiled, and backfilled into the excavation, calculated as follows:

(704 sf) x (4 feet) x (1 CY/27 cubic feet) = 104 CY

Detailed volume calculations are provided in Appendix A.

3.4 Expected Treatment/Destruction/Immobilization/Containment Efficiencies

3.4.1 Petroleum Product

All recovered petroleum product will be transported by tanker truck to the Equilon Anacortes Refinery for recycling and reuse. Handling of the recovered product in this manner was selected because Equilon routinely trucks off-specification or mixed products back to the refinery for recycling and reuse. Product recovered during the interim product recovery program has been handled in this manner. Based on past experience at this site and at other sites in King County, any water recovered with the product will be treated and disposed of under a temporary discharge authorization with the King County Industrial Waste Section.

3.4.2 Petroleum-Contaminated Soil

Petroleum-contaminated soil generated from the TPH Hot Spots will either be transported off-site for landfill disposal or transported to an off-site thermal desorption treatment facility. Landfill disposal and thermal desorption treatment have both been successfully used for petroleum-contaminated soil at similar sites throughout Puget Sound. As stated in Section 2.4, the selection of petroleum-contaminated soil disposition will be made during the construction bidding process. The selected facility will be determined by the nature of the waste, facility acceptance criteria, and treatment limitations of the soil.

Landfill disposal would be in a facility permitted for the level of petroleum contamination in the soil (e.g., Rabanco Roosevelt Landfill, Columbia Ridge Landfill) . Off-site thermal desorption would be at the TPS Technologies, Inc., facility in Tacoma, Washington or a similar facility. By permit, petroleum-contaminated soil is treated at the TPS Technologies facility to below MTCA Method A residential soil cleanup levels achieving a level of destruction greater than 99 percent. The TPS Technologies county solid waste permit and Puget Sound Clean Air Agency Order of Approval are provided in Appendix B.

3.4.3 Lead- and Arsenic-Impacted Soil

Excavation of lead and arsenic-impacted soil is 99% effective at removing the impacted soil from the Site, with some residual soil adjacent to structures or beneath aboveground pipelines. Lead- and arsenic-impacted soil will be transported to a facility consistent with the designation of the waste. It will then undergo stabilization (if needed) and landfill disposal.

3.5 Documentation of Effectiveness

The effectiveness of soil excavation (source removal) to remove contaminated soil will be documented by soil samples as described in Section 2.4.1. Past experience at this Site (prior interim soil removal actions) and similar sites provides the engineering justification that excavation will be effective in removing accessible contaminated soil. For example, soil excavation has been successfully used at hundreds of sites in Puget Sound Documentation on file at Ecology regarding many petroleum-impacted sites also demonstrates that ground water quality improves after removal of contaminated soil from the water table zone. The engineering justification for the design of other aspects of the remedial project, such as excavation side slopes and free product removal, is based on experience at this Site and similar projects.

3.6 Demonstration of Compliance with Cleanup Requirements

Compliance with cleanup requirements will be demonstrated by sampling and testing soil samples from the excavation limits, and quarterly ground water monitoring. The sampling frequency is presented in Section 2.4.1. The quarterly groundwater monitoring program is described in Section 7, with details provided in the Equilon *Compliance Monitoring Plan.* The engineering justification for these elements are based on Ecology guidance, as described in Section 2.4.1, and past experience at the Site and similar sites.

4 SPILL CONTROL AND SAFETY DESIGN

4.1 Control of Hazardous Materials Spills, Accidental Discharges and Stormwater

Procedures to control spills will be incorporated into the design and will include the use of a lined soil stockpile area, a lined and bermed decontamination area, and an overall minimal amount of liquids handling. The material most likely to be spilled during the Site cleanup actions will be contaminated soil. If spilled, this soil will be managed consistent with the contaminated soil handling plan that the contractor will submit prior to construction. Decontamination procedures will be described in the construction bid documents (plans and technical specifications). In the event of any accidental discharge, the response and cleanup actions will be consistent with Equilon's emergency response plan.

Erosion and sediment control measures will be detailed in the grading permit to be obtained from the city of Seattle. All such measures will comply with Ecology's *Storm Water Management Manual for the Puget Sound Basin* (Ecology, 1992). Erosion and sediment control measures will be implemented as required by weather conditions and may include:

- Plastic sheeting beneath and over soil stockpiles to prevent erosion
- Straw bales, berms, or filter fabric to protect the soil stockpiles and excavations from runoff
- Silt fencing or other erosion control measures across discharge points along the site boundary to control off-site erosion and sediment transport
- Straw bales or filter fabric to protect existing catch basins in the Main Tank Farm and Terminal from sedimentation
- A stabilized construction entrance to reduce the amount of mud, dirt, and rocks transported onto public roads by motor vehicles
- Dust control to prevent surface and air movement of dust from exposed soil surfaces

4.2 Long-term Safety of Workers

All construction activities will be completed in accordance with design criteria, WISHA regulations for construction safety and work at hazardous waste sites, and local standard of practice for construction. The cleanup actions at the Site will be designed to be completed with clean fill, asphalt, or concrete over soil that is below the cleanup action levels. When the cleanup actions are complete, potential exposure pathways (e.g., direct contact, ingestion, inhalation of dust, groundwater to surface water) will be eliminated, and the Site will not pose a threat to future long-term workers at the Site.

5 MANAGEMENT OF RESIDUAL WASTES

Residual water from equipment decontamination, decontamination solutions, and disposable personal protective equipment are wastes that will be generated during this cleanup action. Residuals will be managed in accordance with all applicable local, state, and federal requirements. The following residuals management procedures will be used:

- All water generated during decontamination activities will be placed in 55-gallon drums or tanks
- Drums or tanks will be labeled with the date filled, the location from which the contents were collected, and a description of the contents (including appropriate quantity)
- Drums and tanks will be sealed and secured daily. An on-site staging area for the accumulation of drums and tanks will be established by Equilon on the Terminal for each phase of the project. Drums and tanks will be stored in the designated temporary holding area until characterized for disposal
- A record of all generated residuals as stored in drums and tanks will be maintained to expedite characterization and disposal upon completion of construction activities
- Recovered product and product/water mixtures will be placed in the appropriate collection tank in the main terminal and recycled by Equilon
- Disposable clothing and equipment will be placed in plastic bags and disposed of as solid waste

6 CONSTRUCTION

6.1 Construction Plans and Specifications

Construction plans and specifications will be prepared under separate cover to detail the cleanup actions to be performed in accordance with WAC 173-340-400(4)(b).

The construction bid plans and specification will:

- Be prepared in conformance with currently accepted engineering practice and WAC 173-340-400 (4)(b), plans and specifications will be stamped/signed by a Washington State Registered P.E.
- Provide a general description of the project which details the cleanup actions, including work to be done, a summary of design criteria, an existing facility map, adequate site surveying, and a copy of permits/approvals
- Provide detailed plans and specifications necessary for construction, including surface contours/ existing and final, construction materials storage, construction waste storage/management, utility locations within cleanup areas, surface drainage, pumps, piping and valves, treatment units, materials, backfill/rip-rap, and change in grades
- Provide description of construction impact controls (including dust, traffic, and noise)
- Provide construction documentation including specific quality control tests like soil density/in place compaction, moisture content, material strength, sub-grade, spot elevations, frequency of tests, and acceptable results
- Provide compliance monitoring plan including monitoring during construction and a sampling and analysis plan for sampling to be completed during construction

6.2 Construction Quality Control and Quality Assurance

Construction quality control will be performed by the contractor, consistent with the requirements and provisions of the technical specifications. Construction quality control

will include the necessary elements to ensure that the provisions of the contaminated materials handling plan are being followed. In accordance with WAC 173-340-400(7)(b), all aspects of construction will be performed under the supervision of a professional engineer registered in the state of Washington or a qualified technician under the direct supervision of the engineer. The engineer and qualified technicians under his supervision are the construction quality assurance (CQA) organization.

A construction quality assurance (CQA) plan will be provided in the construction bid documents (plans and specifications). The CQA plan will provide the following:

- Project organization
- Identification of CQA personnel and responsibilities
- Description of the construction testing
- Documentation
- Change order procedures

The CQA engineers will also provide as-built drawings and a report, which details all aspects of the construction. The as-built report will also contain certification from the engineer that the work performed was conducted in substantial compliance with the plans and specifications.

7 DEMONSTRATION OF COMPLIANCE WITH CLEANUP REQUIREMENTS

Compliance with cleanup requirements and documentation of effectiveness will be demonstrated by sampling and testing soil samples from the excavation limits, product monitoring, quarterly ground water monitoring, and a contingency plan. Groundwater compliance, product monitoring, and the contingency plan are described below, with details provided in the Equilon *Compliance Monitoring Plan* (EMCON and LCI, 1999). The engineering justification for these elements are based on Ecology guidance, as described in Section 2.4.1, and past experience at the Site and similar sites.

7.1 Soil Removal

The effectiveness of soil excavation (source removal) to remove contaminated soil will be documented by soil samples as described in Section 2.4.1. Past experience at this Site (prior interim soil removal actions) and similar sites provides the engineering justification that excavation will be effective in removing accessible contaminated soil. For example, soil excavation has been successfully used at hundreds of sites in Puget Sound Documentation on file at Ecology regarding many petroleum-impacted sites also demonstrates that ground water quality improves after removal of contaminated soil from the water table zone. The engineering justification for the design of other aspects of the remedial project, such as excavation side slopes, is based on experience at this Site and similar projects.

TPH. Soil hot spot removal related to TPH contamination (Areas 1, 2, and 5) will be performed to the extent technically practicable (considering structural and engineering limitations. As such, performance soil sampling (e.g., soil sampling in excavation sidewalls) for TPH will not be conducted to confirm that hot spot cleanup levels (10,000 mg/kg TPH or 20,000 mg/kg TPH) have been attained. However, post excavation side-walls and bottom pit soil sampling will be provided to document the limitation of the excavation activities and the residual concentrations left behind for Restrictive Covenant purposes. This documentation will be contained in the Post Excavation Report to Ecology referenced in the Schedule part of this Engineering Design report. Confirmational monitoring of these actions will be performed in accordance with Equilon's *Compliance Monitoring Plan* (EMCON and LCI, 1999).

Lead and Arsenic. Lead- and arsenic-impacted surface soil will be excavated during the cleanup of the Main Tank Farm (Area 3) and the Oil/Water Separator (Area 5). Performance monitoring will include collection of forty-eight random surface soil samples (forty-three in the Main Tank Farm and five at the Oil/Water Separator) at the bottom of the excavations. The purpose of these samples will be to confirm that the cleanup action has attained cleanup standards. Specific sampling procedures will be provided in the construction bid documents for the project.

7.2 Product Monitoring

Monitoring wells MW-204, MW-208, MW-210, MW-211, and MW-212, and well points WP-1 through WP-8 will be monitored for the presence of floating product and for potential indicators of product such as odor and sheen. Floating product is defined as a measurable thickness of product (greater than or equal to 0.01 feet thick). Sheen is defined as a visible display of iridescent colors on equipment or water removed from a monitoring well. Product performance and confirmational monitoring will be performed in these wells. The product performance standard is a "measurable product thickness", and the product cleanup standard is "no visible sheen."

7.3 Groundwater Compliance Monitoring

Monitoring wells MW-05, MW-102, MW-105, MW-112, TES-MW-1, and MW-201 were below cleanup levels. These wells will be included in the program due to their location adjacent to areas with soil cleanup actions or to provide a property boundary sentry well network. The fact that the water quality is already below cleanup levels before hot spot cleanup shows that the proposed cleanup is conservative. Monitoring in these wells will be focused on the IHSs (BTEX, TPH) to provide water quality data for baseline data and trend analysis. These wells will not be monitored for natural attenuation parameters since cleanup levels have been already met in these wells.

MW-213 and MW-214 are two conditional point of compliance wells located at the Shoreline Manifold Area. The two wells are located as close as possible to the area of concern and screened at the bottom of the bulkhead to monitor water quality concentrations at the groundwater/surface water interface or the quality of water entering the Bay. Data collected to date in the well have been below cleanup levels and below the laboratory detection limit, indicating that the interim actions at the Shoreline Manifold Area have been effective. MW-213 and MW-214 will be included in the compliance monitoring program and monitored for BTEX, TPH, and cPAHs.

The monitoring objectives have been categorized as confirmational, performance, and sentry.

- Performance monitoring is to confirm that the cleanup action has attained performance of cleanup standards

- Confirmational monitoring is to confirm the long-term effectiveness of the cleanup action once performance and cleanup standards have been met.

- Sentry monitoring is to provide early warning of off-site contaminant migration

Groundwater samples collected from all wells during confirmational and sentry monitoring will be submitted to a laboratory for analysis of the site petroleum-related IHSs (BTEX, TPH-G, TPH-D, and TPH-O). Additionally, samples collected from wells MW-05, MW-101, MW-104, MW-105, TX-03, TX-04, and TX-06 will be analyzed for total and dissolved arsenic and lead to monitor the surface soil cleanup action in the Main Tank Farm.

In addition, monitoring will be performed to monitor the performance of natural attenuation. Groundwater samples will be collected from six monitoring wells at the north end of the Main Tank Farm and in the North Tank Farm for this evaluation. Wells TES-MW-1 and MW-201 will represent groundwater quality upgradient and downgradient, respectively, of a plume of TPH-G and BTEX. Monitoring wells MW-101, TX-03, MW-202, and MW-203 will represent wells in the plume.

7.4 Contingency Plan

A contingency plan is a cleanup technology that serves as a "backup" remediation technology in the event that the preferred option fails or proves ineffective in a timely manner (five years after implementation of the preferred option). A contingency plan will be triggered and implemented within 30 days of meeting any of the following criteria:

- The results of the groundwater monitoring program indicate elevated contaminant concentrations over the specified restoration time frame of five years after implementing the preferred corrective options

- Contaminants are identified in point of compliance wells located outside of the original plume boundary, indicating renewed contaminant migration

- Contaminant migration is not decreasing at a sufficient rate to ensure that the primary and secondary concerns identified for the site are being met

The following actions will be initiated if the above criteria are triggered:

- Identify the source(s) causing the criteria to be triggered. For example, at the Shoreline Manifold Area, an increasing trend could indicate a new release. The

highest priority in the compliance plan would be to identify and control the source.

- Remove the source (e.g., impacted soil) or implement appropriate treatment (e.g., adding oxygen releasing compounds), as needed, to the extent practicable. For example, additional hot-spot soil at the Shoreline Manifold Area will be excavated to the extent practicable when the underground pipelines are relocated above ground. Sources will be removed as long as removal does not impact the integrity of existing structures or create a greater environmental hazard.

- If residual product is identified beyond the capture zone of the existing product recovery network, the network will be evaluated and expanded to ensure removal of free product from the water table.

- If the results (increasing trend in surface water quality in point of compliance wells and a significant new product release at the Shoreline Manifold Area) indicate there has been potential environmental impacts to aquatic organisms in Elliott Bay, then sediment and bioassay sampling will be implemented in accordance with the procedures outlined in the State of Washington Sediment Management Standards.

8 PUBLIC PARTICIPATION

Equilon will cooperate and support Ecology in the public participation activities during the engineering design and remedial action phases of the cleanup project at Equilon's Seattle Terminal in accordance with Section XXIV of Consent Decree 99-2-07176-OSEA. These activities may include:

- Fact Sheets
- Public Notices
- Meetings with Interested Public and Local Governments
- Public Presentations on the Progress of Remedial Action

9 SAFETY

A health and safety plan (HASP) for the Site cleanup actions will be prepared by the contractor before beginning work on the Site. The plan will be prepared consistent with the health and safety requirements of Equilon, Ecology (per WAC 173-340-810), and the Washington Industrial Safety and Health Act (WAC 296-24, 296-62, and 296-155). All workers on the site will be required to read and sign the HASP. A health and safety meeting will be conducted with the contractor, subcontractors, construction testing personnel, and applicable Equilon employees before starting work at the Site.

10 SCHEDULE

The proposed RD/RA schedule has been developed to meet the requirements of the Consent Decree No. 99-2-07176-0SEA schedule (Exhibit E) and provide more detail on specific project phases. Since the Terminal is an active bulk fuel distribution facility, the project must be completed in phases. The Shoreline Manifold Area (due to its proximity to Elliott Bay) has been identified as the cleanup area of primary concern. This cleanup schedule reflects that priority while accounting for the operational constraints (e.g., ongoing shipments of petroleum product via pipeline and barges) at the Site.

The schedule provided in this report identifies the tasks required to complete the remedial design, permitting, construction bid documents, and initiate cleanup. Potential permits required for the project include excavation and grading permit, SEPA DNS, and shoreline permit. A copy of the approved Engineering Design Report will be submitted to the City with the permit application and application fee. Many of the tasks are dependent on previous tasks and may change if the schedule is modified for the previous tasks. For example, the draft schedule assumes that hot spot cleanup at the Shoreline Manifold Area will be performed in two phases, with second phase work performed concurrent with aboveground pipeline relocation. The pipeline relocation project is still very conceptual in nature; specific design and construction elements of that project (e.g., schedule, location of pipelines, number of pipelines) will determine the scope and schedule of Phase 2 Shoreline Manifold Area Hot Spot Soil Cleanup.

The estimated time for cleanup is based on preliminary schedule estimates from remediation contractors; these schedules will be refined during the construction procurement process.

11 REFERENCES

EMCON and Lovely Consulting, Inc. 1999. *Compliance Monitoring Plan, Equilon Seattle Sales Terminal, Seattle, Washington.* Prepared for Equilon Enterprises LLC. February 1999.

Lovely Consulting, Inc. and EMCON. 1997. *Final Focused Feasibility Study Report, Texaco Harbor Island Terminal, Seattle, Washington.* Prepared for Texaco Refining and Marketing, Inc. May 1997.

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Tetra Tech, Inc. 1988. Puget Sound Estuary Program, Elliot Bay Action Program: Evaluation of Potential Contaminant Sources. Prepared for US EPA, Region 10 – Office of Puget Sound, Seattle, Washington. September 1988.

DRAWINGS

FIGURES

TABLES

APPENDIX A

APPENDIX B